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HORTICULTURAL ABSTRACTS.

Indexing.

For those wishing to card-index these abstracts the appropriate numbers of the Brussels International Decimal Classification are given at the head of each abstract. Further details of the system will be forwarded on demand.

Method of Quoting.

1. Periodicals. The following order is kept: Title of article—name of periodical—year of publication—volume no.—pertinent pages in volume—bibliographical references, where given.

e.g., *Scientific Agriculture*, 1930, 11 : 123-9, bibl. 7.

Only when a volume is not numbered consecutively throughout its length, each separate number starting afresh, is reference made to the part or number concerned.

e.g., *Citrus Industry*, 1930, 11 : 2 : 4-5.

2. Bulletins, etc. The following order is kept: Title of article—name of station issuing bulletin—type and serial number of bulletin—year of publication—number of pages—bibliographical references, where given.

e.g., *New York State Agr. Exp. Sta. Geneva Tech. Bull.* 162, 1930, pp. 14, bibl. 13.

Abbreviations used in this Number.

Among other more common abbreviations the following are used:—

Alg.—Algemeen.

Amer.—American.

Bull. Mat. Grass.—Bulletin des Matières Grasses de l'Institut Coloniale de Marseille.

Lab.—Laboratorium.

Landb.—Landbouw.

Med.—Mededeelingen.

Mem.—Memoir.

Proefsta.—Proefstation.

Q.—Quarterly.

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Horticultural Abstracts

January—March, 1931

GENERAL HORTICULTURE.

1. **Bois, D.** 634.1/8
Les plantes alimentaires chez tous les peuples et à travers les ages. Vol. II. Phanerogames fruitières. (Food plants, Vol. II. Fruit bearing phanerogams.) 1928.
8vo. Lechevalier, 12, Rue de Tournon, Paris, VI^e, pp. 638, figs. 261.
Notes are given on the origin of different fruits, on the different varieties of the same fruits, and the method of distinguishing them, on the use and characteristics of the fruit and in some cases on the method of cultivation.
An extremely useful reference book.

2. **Gourley, J. H.** 634.11
Some basic factors involved in the production of better grades of apples.
Scientific Agriculture, 1930, 11 : 123-9, bibl. 7.
The improvement of size, colour and "finish" are considered.
Size can be influenced by proper thinning, pruning and soil treatment, thinning being the most important. Colour depends upon proper development and accumulation of carbohydrates (sugars), light is indispensable but can only function if there is a development and accumulation of sugar derivatives. As regards fertilizers, most of the data yielded so far show no advantage to colour by use of potassium, phosphorus, iron or a complete fertilizer. Thinning increases colour, probably by increasing the supply of storage sugars available to the remaining fruits. Surface quality or "finish" has been greatly improved, without affecting efficient pest control, by using sprays of greatly reduced strength (e.g. Bordeaux, $\frac{3}{4}$ lb.; copper sulphate, $2\frac{1}{2}$ lbs., high grade calcium lime to 50 gals. spray material: Lime Sulphur, 1 gal. solution to 80 of water); by the use of dry lime sulphur in place of liquid; by the addition of 5 lbs. high grade calcium lime to 50 gals. of lime sulphur spray solution; by the use of dusting in place of spraying.

3. **Roodenburg, J. W. M.** 631.588.2: 631.544: 635.6
Kunstlichtcultuur. (Cultivation of plants in artificial light.) [English summary.]
Med. Lab. Tuinbouwplantenteelt, Wageningen, 14, 1930, pp. 68, bibl. 24.
Results of trials since 1928 with various horticultural plants, e.g. melons, cucumbers, tomatoes, sweet peas, etc. The best source of illumination was found to be Neon light. Expenses are high, hence floriculture seems more suitable for the practice. The best way of dealing with young plants is to grow them on a small area together and illuminate them until the time of replanting in permanent place.

4. **Niethammer, A.** 631.588.2: 631.544: 635.9
Frühreiben im elektrischen Lichtraume im Zusammenhange mit histo-chemischen Untersuchungen. (Electric light forcing in connection with histochemical investigations.)
Gartenbauwissenschaft, 1930, 3 : 284-300, bibl. 16.
An account of experiment on ornamental shrubs carried on over the whole of one winter. Winter spurs were forced into growth at earlier dates by electric light treatment. The effect of the Vita Lux lamp was even greater. Histochemical and analytical examinations show the different changes taking place in winter spurs during the rest period and that of bud development.

5. **Reinhold, J., and Schmidt, M.** **631.589:634/5**
 Bodenbedeckungsversuche auf den Moorversuchsfeldern der Dahlemer Lehr- u. Forschungsanstalt für Gartenbau in Groszbeeren. (Mulching trials on the fen experimental areas of the Dahlem Res. Sta. at Groszbeeren.) *Gartenbauwissenschaft*, 1930, 3 : 527-634, bibl. 48.
 Experiments were mainly on vegetables but included one on bush apple trees (var. Ernst Bosch), the plots, each of 18 trees, being twice replicated, the paper—apparently “ Natronagpapier ”—being spread in 2 metre strips on either side of the rows. Another was on strawberries. The latter yielded no result, but in the former a noticeable feature was the earlier but more protracted blossoming period of the mulched plots.
 In general it was found that results of mulching depend greatly on such environmental and climatic conditions as, amount of sunshine, soil, height of water table, etc., and that these, together with the varying amount of evaporation of rain water and its removal under mulch and non-mulch conditions, need further study. Actual results obtained were encouraging. The tables and figures are excellent.

SMALL FRUITS AND NUTS.

6. **Witt, A. W.** **634.51**
 Further observations on walnut growing in England.
J. Roy. Hort. Soc., 1930, 55 : 257-65.
 Notes on raising seedling stocks of *J. regia* and *J. nigra*; vegetative propagation and its possibilities including methods of layering, grafting, top-grafting; precocity in bearing; pollination and non-setting of fruit; frost injury to precocious varieties; absence of incompatibility among *Juglans* species; the clone races being raised at Malling, viz.: *J. regia* 6 selections, *nigra* 3, *californica* 1, *cinerea* 1, *mandschurica* 1, Royal (hybrid) 4, Paradox (hybrid) 3.

7. **Brierley, W. G.** **634.711:581.148.5**
 A study of senescence in the red raspberry cane.
Minnesota Agr. Exp. Sta. Tech. Bull. 69, 1930, pp. 36, bibl. 30.
 The writer concludes that the cambium in the cane begins to decline in meristematic activity in the first season and is relatively feeble in the old cane. The apical meristem stops functioning at the end of the first season, no new winter buds are formed in the second year and the cambium in the old cane forms relatively small amounts of new xylem and phloem elements. The evidence relating to the feebleness and decline of tissues within the old cane is in harmony with the decline of the cane as a whole.

8. **Gerhart, A. R.** **634.75-1.556.1:581.12**
 Respiration in strawberry fruits. (Contribution from the Hull Botanical Laboratory 399.)
Bot. Gaz., 1930, 89 : 40-66, bibl. 33.
 Description of respirometer used. The variations in respiration according to different environmental conditions are noted. These largely affect transportation problems.

9. **Darrow, G. M.** **634.75-1.547:551.56**
 Experimental studies on the growth and development of strawberry plants.
J. Agr. Res., 1930, 41 : 307-26.
 Studies on the relations between the growth of strawberry plants and climatic conditions throughout the season. No generalizations are attempted from the particular instances quoted here.

10. **Mann, C. E. T.** **634.75:581.144.2/3**
 Studies in the root and shoot growth of the strawberry. V. The origin, development and function of the roots of the cultivated strawberry.
Ann. Bot., 1930, 44 : 55-86.
 The development of the “ runner ” of the strawberry plant is fully examined with special reference to the origin of adventitious roots. It is shown that the structure of the lateral roots differs essentially from that of the main adventitious roots.

11. **Waldo, G. F.** 634.75:581.145
 Fruit bud development in strawberry varieties and species.
J. Agr. Res., 1930, **40** : 393-407, bibl. 10.
 Experiments under Maryland conditions. Fruit bud differentiation extended over a considerable period in some varieties, in others it occurred in a relatively short time. There is no absolute correlation between early differentiation of fruit buds, early blooming and early ripening or between late differentiation, late blooming and late maturity.

12. **Waldo, G. F.** 634.75:581.145
 Fruit bud formation in everbearing strawberries.
J. Agr. Res., 1930, **40** : 409-16, bibl. 3.
 After producing a spring crop of fruit, strawberries of this type send out a few runners from the axils of their leaves. Instead of continuing runner production over an extended period they may send out a flower stalk from the leaf axil, though more often they produce very short branches, the growing point of each of which soon differentiates a fruit bud. Fruit is thus produced through summer from a crown which gradually becomes more and more branched. The almost entire absence of developing flower stalks over a period of 3 or 4 weeks immediately following the spring crop, together with favourable temperatures and long days, are suggested as the causes of the unusual activity of everbearing strawberries in producing runners, new branches and differentiating fruit buds all at this time.

13. **Theron, C. J.** 634.8
 Viticulture in Europe.
Farming in South Africa, 1930, **5** : 107-8, 115.
 Notes on storage of stocks, grafting methods, inducement of callusing, packing and care prior to planting out, planting out and care in nursery, as practised at Richter's establishment of Montpellier in Hérault, France. The results are better than are got in South Africa.

14. **Theron, C. J.** 634.8
 The preparation and cultivation of vineyard soils in Europe.
Farming in South Africa, 1930, **5** : 236-7.
 Notes on thoroughness of preparing vineyard cultivation to 2 to 3 feet in depth. Spacing varies with climate, the colder the climate the closer the spacing. The Maroger system of light but frequent cultivations combined with wide spacing and trellising is described. This system is now being tested at Elsenburg.

15. **Einset, O.** 634.8:581.162.3
 Open pollination *versus* hand pollination of pollen-sterile grapes.
New York State Agr. Exp. Sta. Geneva Tech. Bull. **162**, 1930, pp. 14, bibl. 13.
 Loose bunches are characteristic of self-unfruitful grapes when left to open pollination, while compact clusters are obtained from hand pollination.
 The data obtained indicate that the natural pollen carriers (wind and insects) are not efficient in the case of the grape and that artificial pollination is required to obtain maximum crops in pollen sterile varieties.

16. **Faes, H., and others.** 634.8-1.541.11-1.55
 Etude de l'influence de divers porte-greffes sur la qualité et quantité de récolte. (Study of the influence of various rootstocks on the quality and quantity of crop.)
L'annuaire agricole de la Suisse, 1930, pp. 355-97.
 The final results of research of over twenty years. Different soils require different stocks for best results. The substitution of new stock varieties was fully justified but some of the older sorts are still valuable.
 The merits and demerits of various stocks are carefully analysed. The influence of the stock can be exaggerated in the minds of careless growers, who are too prone to attribute the results of their bad cultivation to unsuitable stocks rather than to its true cause. There is no one ideal stock which will suit all scion varieties and all soil conditions.

17. **Partridge, N. L.** 634.8-1.542
 The fruiting habits and pruning of the Campbell Early grape.
Michigan Agr. Exp. Sta. Tech. Bull. **106**, 1930, pp. 48, bibl. 24.
 In pruning the vines it is best to have production over a small number of nodes. Canes of the Campbell Early with 15 nodes were more productive than those of any other length. If vines are not strong enough to support four 15 bud canes, it is better to reduce the number of canes rather than reduce the number of buds on the individual canes very much. Best methods for pruning this and the Concord grape vine are discussed.

18. **Dalmasso, G., and others.** 634.835.094
 Gl'ibridi produttori diretti a Conegliano. (Hybrid direct producers at Conegliano.)
Annali della sperimentazione agraria, 1930, **5** : 9-151, bibl. 4.
 Notes on three years' work at the Research Station on direct producers including (1) with black grapes examples of some 82 Seibel, 20 Couderc, 12 Castel and 21 various crosses, (2) with white grapes, 31 Seibel, 11 Couderc, 13 Castel and 13 various crosses. Under their conditions the authors give data on growth, disease resistance, precocity, yield, type of fruit. Tables of merit are given, but the authors warn against hasty conclusions. The work is being continued.

19. **Dalmasso, G.** 634.843-1.541.11
 Riparia x Rupestris 3309 Couderc.
Annali della sperimentazione agraria, 1930, **5** : 153-96, bibl. 25.
 The original hopes regarding this rootstock are not altogether fulfilled. It does not withstand well extremes of drought or of humidity. As regards compatibility it may be considered to belong to the group described by Racah as "rootstocks possessing limited general affinity" Under certain circumstances its merits are obvious, but they will always need testing.

20. **Nichols, P. F., and Christie, A. W.** 664.85.8.047
 Dehydration of grapes.
Univ. California Agr. Exp. Sta., Berkeley, Bull. **500**, 1930, pp. 31, bibl. 14.
 For highest efficiency the grapes must be dipped, special dips containing olive oil, glycerine or mineral oil offering possibilities for improvement of colour and keeping quality. Dehydrators suitable for prunes, if flexible enough, give satisfactory results with grapes. The heat and air supply requirements are greater for grapes than for prunes. The best relative humidity at the finishing temperature should be about 25 per cent.

TREE FRUITS.

Pollination, etc.

21. **Passecker, F.** 634.11/13: 581.162.3
 Kann man aus der Keimfähigkeit des Pollens in Zuckerlösung auf dessen Tauglichkeit zur Befruchtung schliessen? (Can the aptitude of pollen for fertilization be determined from its germination capacity in sugar solution?)
Gartenbauwissenschaft, 1930, **3** : 200-36, bibl. 20.
 Pollen germination tests in sugar solutions of suitable concentrations without the addition of stigmas give under test conditions a true picture in the case of apples and pears of the aptitude of the pollen for cross pollination. The addition of stigmas of different varieties to the sugar solution does not help towards a true determination of the fertilization capacity of those varieties. The fertilization capacity of stone fruits, especially of cherries, can, so far, only be estimated by pollination tests. Generally speaking, pollination tests are still essential for determining self-fruitfulness and self-sterility both of pome and stone fruits.

22. **Wentworth, S. W.** 634.11:581.162.3
 Further evidence of the variability of apple pollen as determined by the spur-unit method.
Proc. Amer. Soc. Hort. Sci., 1929, **26** : 43-8, bibl. 2.
 Pollen from different trees of the same varieties, i.e., Rhode Island Greening and Baldwin, was found to vary in efficacy. The time value of a variety as pollenizer can best be estimated by using a sample of pollen got from several trees of the staminate variety and testing this on 3 or 4 trees of the pistillate variety.

23. **Reinecke, O. S. H.** 634.1/2:581.162.3
 Field and laboratory studies of the pollination requirements of deciduous fruit trees grown in South Africa.
Stellenbosch Univ. Coll. Agr. Sci. Bull. **90**, 1930, pp. 91, bibl. 223.
 The studies are described in detail. Lists are given of the self-fertile varieties of the fruits dealt with and of those requiring to be interplanted with good pollenizers, which are also named.

24. **Brittain, W. H.** 634.11:581.162.3
 Some aspects of the pollination problem in the apple orchard.
Nova Scotia Fruit Growers Assocn., 66th Ann. Rept., 1930, pp. 79-94.
 Report of an investigation undertaken at the instigation of the Dominion Department of Agriculture to determine whether the supposed killing of bees by poison dusts had adversely affected the fruit crop.
 As a result of experiments it is tentatively concluded that : (1) On all varieties the exclusion of pollinating insects materially reduces the percentage of fruit produced even in the case of self-fertile varieties. (2) Pollenizers possessing pollen of good germinability give better results than pollenizers showing low germinability. The yield, however, is not always in proportion to the germination of the pollen used, as some combinations appear to be more compatible than others. (3) In all cases except one (Baldwin) better results were obtained by introducing bouquets of an effective pollenizer. (4) In the case of Baldwin better sets were obtained in the tent containing bees but no bouquets, than where McIntosh was used as a pollenizer, but results might have been different had pollen of another variety than McIntosh been used. Baldwin is capable of producing fair crops without cross pollination. (5) No variety proved 100 per cent. unfruitful, but Gravensteins and Spys most nearly approach a self-unfruitful condition. (6) It appears that a higher percentage set may be obtained from self-unfruitful varieties when the whole tree rather than individual limbs is covered with a tent. (7) A good commercial set was obtained in no case without the aid of bees.

25. **Rahman, Khan A.** 634.25:581.162.3
 Some observations on the pollination of peaches.
Agr. J. India, 1930, **25** : 492-4.
 Two Indian varieties, Safaida and Hakim, growing at Pusa were selected for observation. Although Hooker, in "The Flora of British India," describes the flowers as hermaphrodite, it was found that out of 1,400 flowers examined, 560 were staminate only, and 840 hermaphrodite. The stigma protrudes beyond the closed petals a day before the bud opens, and is receptive at this stage. The next day it is again covered by a growth of the petals. The anthers dehisce in succession. While owing to the position of the anthers selfing always takes place, cross pollination was proved to be essential to fruit setting.

26. **Doovina, O. M.** 634.23-1.521.5
 On the germination of cherries and Mahaleb stones according to sowing time and previous treatment. [Russian-English summary.]
Mleev Hort. Exp. Sta., Pom. Sect., Bull. **36**, 1930, pp. 13, bibl. 13.
 Some of the results of four years' experiments are : Best time for sowing was found to be in summer, immediately after ripening of the fruit. Washing the stones free from pulp and sowing, in the case of Mahaleb at once and in that of sweet and sour cherries after drying for three consecutive days in the sun, gave the best results.

27. **Howlett, F. S.** 634.11-1.522
 Further experiments on the relative self-fruitfulness of apple varieties.
Proc. Amer. Soc. Hort. Sci., 1929, 26 : 49-55, bibl. 7.
 Of apples tried over a period of five years the following have the lowest degree of self-fruitfulness : McIntosh, Rhode Island Greening, Stayman Winesap, Delicious, Winesap. In an intermediate group are : Jonathan, Grimes Golden, Oldenburgh, Wealthy, Baldwin, Yellow Transparent. The third group with higher degrees of self-fruitfulness includes Rome Beauty and Gallia Beauty. Even those of the last group should not be planted alone in blocks.

28. **Palmer, E. F.** 634.1 /7-1.523
 Breeding new varieties of fruits.
Nova Scotia Fruit Growers Assocn., 66th Ann. Rept., 1930, pp. 28-34.
 A short review of recent work in fruit breeding in Eastern North America.

Vegetative Propagation.

29. **Hatton, R. G.** 634.1 /2-1.541.11 /12
 Stock-Scion relationships. (Masters Memorial Lectures, 1929.)
J. Roy. Hort. Soc., 1930, 55 : 170-211, bibl. 73.
 Method of grafting on the stock stem is contrasted with whole and piece root grafting. Attempts to raise true lines of seed are quoted. A wider use of vegetatively propagated rootstocks is suggested. Experiments proving effect of stock on scion are summarized. Examples are given of modification of stock influence due to soil and subsoil type, and to cultural treatments such as manuring. It is found that special manurial treatment cannot entirely make up for inferiority of rootstock. Efforts to elucidate the cause of stock influence are reviewed and the effect of an intermediate scion in relation thereto is discussed. The reciprocal influence of scion on stock is considered.

30. **Gleisberg, W.** 634.1 /2-1.541.11
 Die Obstunterlagenselektion. (Choice of fruit tree rootstocks.)
Züchter, 1930, 2 : 149-70, bibl. 192.
 A list of rootstocks commonly used in Germany for apples, pears, cherries, plums and peaches, is compared with that given by Howard for the U.S.A. All varieties can be induced to form roots, though this is not necessarily economic. Rootstocks conducive to standard trees are not necessarily deep rooted, nor those producing dwarf trees shallow rooted. The factor of shallow or deep rootedness is not the only important consideration. Others equally important are the type of growth induced in the scion, compatibility, permanence of union, time of flowering, fruiting, disease resistance. By vegetative propagation from the present Paradise and Seedling stocks suitable rootstocks should be obtainable for all scion varieties. Standardization and description of the present stocks in use would be most beneficial. A description is given of 18 types now vegetatively reproduced at Ketzin.

31. **Gleisberg, W.** 634.1 /2-1.541.11
 Obstunterlagenselektion nach Bewurzelung u. Wunderwachung. (Choice of fruit tree rootstocks according to rooting and callusing.)
Züchter, 1930, 2 : 227-37, bibl. 33.
 The rooting capacity and the healing of graft wounds are of the greatest importance in choosing rootstocks. The proper healing of the union is essential and varies greatly for any one scion on different rootstocks. New and better rootstocks should be sought for by testing out and vegetatively propagating the infinite variety of seedlings.

32. **Gleisberg, W.** 634.1 /2-1.541.44
 Die wichtigsten Umpropfkrankheiten. (Top grafting troubles.)
Reichsverband des Deutschen Gartenbaus E. V. Flugblatt 15 issued as supplement to *Obst u. Gemüsebau*, 1930, **76**, No. 3, pp. 7.
 Normal healing of grafting wound. Unfavourable phenomena due to faults in technique and suggestions on how to avoid them. Other parasitic and non-parasitic phenomena. Illustrations are clear and practical.

33. **Swarbrick, T.** 634.11-1.541.11-1.536
 Root regeneration upon transplanted apple rootstocks.
Bristol Univ. Res. Sta., Long Ashton, Ann. Rept., 1929, pp. 40-6.
 Stocks (Malling Type 13) were removed from stool bed on October 15th and graded for size. Roots were removed from half of them and left on the rest. Stocks were then replanted. Examination of the roots of both lots was made on five dates during the winter and spring. Although the most vigorous root regeneration took place on the stocks from which all roots had been removed at transplanting, yet in the following May the uncut trees had the larger effective root system. In the light of present knowledge it would seem advisable to retain at least a fair amount of the original root system at transplanting.

34. **Lange, K. P.** 634.1 /2-1.541.1
 Growing yearlings in the nursery without a stub. [Russian-English summary.]
Mleev Hort. Exp. Sta. Pom. Sect. Bull. **35**, 1930, pp. 49, bibl. 19.
 The results of two years' trials in the Zawadsky branch of the central nursery of Ukraine with apples, pears and plums on seedling stocks are in favour of growing without a stub in most of the varieties tested.
 (The results appear to confirm those got at East Malling, England, in 1922 with apple scions—var. Lane's Prince Albert, on known vegetative rootstocks. A trial was here made of cutting the stock off close to the bud, as against the usual method of leaving a 3 inch to 4 inch stub above the bud. The result was in favour of close cutting for increasing the height of the maiden tree.—Editor's Note.)

35. **Dahl, C. G.** 634.11-1.541.11
 Försök med uppdragning av grundstammar genom satt av kärnor från vissa mera vanliga äppelsorter. (Experiments in raising rootstocks from seeds of commercial apple varieties.) [English summary.]
Contribution Swedish Permanent Committee Orchard Research No. 20, 1930, pp. 8.
 Trials with seedlings from different commercial varieties. The strongest seedlings came from seed of King of the Pippins, Reinette Ananas, Akero, Bismarck and some Swedish sorts. Reinette Baumann, Ribston, Belle de Boskoop, Blenheim, Gravenstein and some Swedish sorts were thoroughly unsatisfactory for this purpose. Seeds of strong growing trees often gave very weak seedlings. Varieties known to have supernormal numbers of chromosomes should be avoided.

36. **Upshall, W. H.** 634.11-1.535.6
 Investigations on the propagation of apples from root cuttings.
Proc. Amer. Soc. Hort. Sci., 1929, **26** : 80-1, bibl. 4.
 Observations on root piece graft experiments in the greenhouse, 1927-28.

37. **Allen, F. W.** **634.13-1.541.11-1.547.6**
 The texture and ripening of Bartlett pears as influenced by the rootstock.
Proc. Amer. Soc. Hort. Sci., 1929, **26** : 325-7.
 The rootstocks contrasted are French and Japanese seedlings. Fruit from trees on Japanese stocks was firmer but required about the same time for ripening and remained marketable the same length of time. There is indication that general climatic conditions and time of ripening affect keeping quality as much or more than the fact that it is on one or other of these stocks.

38. **Kinman, C. F.** **634.23-1.55:575.24**
 A study of some unproductive cherry trees in California.
J. Agr. Res., 1930, **41** : 327-35.
 The phenomenon of unproductiveness in cherry trees accompanied by malformation of leaves and fruit is common in Californian orchards, especially in the Black Tartarian variety and to a lesser extent in Bing, Lambert and Black Eagle. Attempts to transmit this unproductiveness have been unsuccessful.
 It seems that the unproductive trees are a strain of a variety resulting from the propagation of "sporting" branches or "variegations" and that the trouble may be evaded by care in the choice of propagating wood, or remedied by top grafting.

39. **Tukey, H. B.** **634.23-1.541.11**
 Identification of Mazzard and Mahaleb cherry rootstocks.
New York State Agr. Exp. Sta. Geneva Circ. **17**, 1930, pp. 12, bibl. 6.
 Differentiation one from the other is simple when leaves and flowers are available. With pieces of root the fibrous nature of the Mazzard root, its darker colour, the flaking "bark" and the bitter taste of the bark are good criteria. The wood of Mahaleb is harder and closer grained. The root of Mazzard freshly cut and dipped into ferric chloride solution shows an almost instantaneous blackening of the tissues just under the bark, while that of Mahaleb takes longer and never becomes so black. Iron-alum may also be used for tests.

40. **McLintock, J. A.** **634.23-1.541.11**
 American Mazzard cherry seedlings as rootstocks for cultivated cherries.
Proc. Amer. Soc. Hort. Sci., 1929, **26** : 82-5.
 A plea for the use of Mazzard in preference to Mahaleb owing to better results in later years. French imported Mazzards have been disappointing. The local wild Mazzards are much more promising.

41. **Bijhouwer, A. P. C.** **581.148.5:581.165**
 Over het vraagstuk der "Veroudering" ten gevolge van landurig voortgezette, ongeschlachtelijke Vermeerdering. (The possibility of senility resulting from long continued vegetative reproduction.) [English summary.]
Med. Lab. Tuinbouwplantteelt Wageningen, **12**, 1930, pp. 119, bibl. 194.
 A number of plants including apple and Hevea are cited as being reputed to show signs of degeneration through this cause. In each case except that of *Elodea canadensis*, which needs further investigation, this degeneration has been shown to be due to disease. The opinions of numerous advocates of the senility theory are examined and disproved. Further research is needed on the basis of venation and cell size study, and the resultant data should be statistically interpreted.

Manuring.

42. **Amos, J., Hatton, R. G., Hoblyn, T. N.** **634.11-1.541.11-1.8**
 The response of apple trees on known rootstocks to applications of a complete fertilizer.
Ann. Appl. Biol., 1930, **17** : 657-74, bibl. 7.
 1. At East Malling Research Station a plot of apple trees (Bramley Seedling and Worcester Pearmain, budded on eight distinct varieties of rootstock of the Station's raising) receiving

a balanced manure over a period of eleven seasons is compared with a similar plot, which over the same period had received only applications of non-leguminous green crops.

2. No response to manuring was shown for the first six years.
3. From the seventh year onwards definite differences appeared in vigour, cropping, size, quality of fruit and health of trees.
4. Bramley's Seedling suffered from the starved conditions to a greater degree than Worcester Pearmain.
5. Trees on semi-dwarfing rootstocks suffered earlier and more markedly than those on vigorous rootstocks.
6. A rootstock variety showing bad performance could still give bad trees even when subjected to balanced manuring.

43. **Wallace, T.**

634.11:581.13

Experiments on the manuring of fruit trees. III. The effects of deficiencies of potassium, calcium, magnesium, respectively, on the contents of these elements, and of phosphorus in the shoot and trunk regions of apple trees.

J. Pom. Hort. Sci., 1930, **8** : 23-43, bibl. 8.

Apple trees, var. Stirling Castle, were grown in quartz sand in pots and given the nutrient treatments: Complete nutrient—ditto less Ca, ditto less Mg, ditto less K.

Each treatment produced significant effects on shoot growth and foliage characters.

The various omissions were reflected in the composition of the dry matter of all parts examined. Large decreases in content of K_2O and MgO were effected by deficiencies of these but decreases of CaO were much less.

The bark and wood portions of both one-year shoots and four-year-old main stems showed wide differences in their contents of ash and ash constituents, and it is concluded that in investigations on the composition of shoots and stems of trees it is essential to examine the bark and wood separately.

44. **Davis, M. B.**

634.11:581.13

Investigations on the nutrition of fruit trees. Some effects of deficiencies of nitrogen, potassium, calcium and magnesium, with special reference to the behaviour of certain varieties of apple trees.

J. Pom., Hort. Sci., 1929, **8** : 316-44, bibl. 8.

Apple trees (Bramley's Seedling, Worcester Pearmain, Allington Pippin) were grown in pots in quartz sand, and supplied with: complete nutrient; nitrogen omitted; potassium omitted; phosphorus omitted; calcium omitted; magnesium omitted. The data obtained show *inter alia*: (1) Varietal variation in responding to the different omission treatments. (2) That the omission of an element was reflected by the low percentage of that element in the ash. (3) That the reduction of K_2O was associated with increases of CaO and MgO ; low CaO was accompanied by high K_2O , high MgO and low P_2O_5 ; low MgO was always associated with high CaO , low P_2O_5 , low K_2O , and generally high CaO . (4) That negative correlations existed between CaO and K_2O ; CaO and P_2O_5 , and a positive correlation between K_2O and P_2O_5 .

45. **Degman, E. S.**

634.11-1.84: 664.85.11

Firmness and keeping quality of fruits as affected by nitrogen fertilizers.
Proc. Amer. Soc. Hort. Sci., 1929, **26** : 182-6.

Under Maryland conditions the application of nitrogenous fertilizers does not directly influence the keeping quality of apples. When, however, in connection with the use of nitrogen, orchard practices such as pruning, soil management, thinning, irrigation, etc., are unwisely administered, so that excessively large fruit is produced, or when immature fruit is harvested, there will be a decrease in keeping quality, which is often incorrectly ascribed to the use of nitrogen.

46. **Harlow, L. C.** 634.11-1.8-1.4
 Orchard fertilizers as related to soils.
Nova Scotia Fruit Growers' Assocn., 66th Ann. Rept., 1929, pp. 14-21.
 Organic matter, lime, potash, phosphorus, nitrogen and water supply and their effect on the productivity of the orchard are discussed in turn.

47. **HofMann, F. W.** 634.11-1.8-1.547
 Effects of nitrogen, phosphoric acid and potash applications on yield and circumference growth in ensembled data from cultivated apple orchards.
Proc. Amer. Soc. Hort. Sci., 1929, 26 : 145-8, bibl. 5.
 Trials of the addition of N, P, K and combinations thereof in West Virginia, Pennsylvania and New York show that over the entire limestone section studied there are significant gains in yield and trunk increase when N, NP, NK, or NPK, are used. The odds are generally in favour of the complete series.

48. **Grubb, N. H.** 634.11-1.83
 The reaction to potash fertilizers of apple trees in the field.
Ann. Appl. Biol., 1930, 17 : 674-81, bibl. 2.
 The application of sulphate of potash over a period of years to part of the "Apple Pruning Plot" at East Malling has resulted in : (1) A great reduction of leaf scorch. (2) Greatly increased growth of the trees. (3) A great increase in weight of crop and size of fruit. (4) In some cases better setting of the blossom. (5) In a few cases a probable reduction of blossom bud formation. (6) Heightened fruit colour. (7) No reduction of disease except probably apple mildew (and "leaf scorch"). (8) In one or two cases foliage more resistant to "spray injury."

49. **Gourley, J. H., and Hopkins, E. F.** 634.11-1.84: 664.85
 Some relations of nitrogen to keeping quality of fruit.
Proc. Amer. Soc. Hort. Sci., 1929, 26 : 167-73.
 Under air-cooled storage conditions data indicate no significant difference between the keeping quality of apples high in nitrogen and that of apples under relatively low nitrogen supply.

50. **Ruth, W. A., and Baker, C. E.** 634.11-1.84-1.55
 A comparison of correlations of bloom and yield among nitrogen-fertilized and unfertilized apple trees.
Proc. Amer. Soc. Hort. Sci., 1929, 26, pp. 197-8.
 Trees were treated in 1928 and 1929 as follows : 22 with no fertilizer and no cover crop, 47 with N but no cover crop, 15 with rye alone, 18 with nitrate plus rye.
 The correlations indicate a closer relationship of yield to bloom among N fertilized trees. They show the importance of variations in other factors governing the yield-bloom relationship.

51. **Weinberger, J. H.** 634.1 /7-1.83: 664.85
 The effect of various potash fertilizers on the firmness and keeping quality of fruits.
Proc. Amer. Soc. Hort. Sci., 1929, 26 : 174-9.
 Under varying soil and climatic conditions in Maryland the use of potassic fertilizers, whether alone, in combination with nitrogen or with nitrogen and phosphorus, has not been found to affect the firmness or keeping quality of apples, peaches or strawberries.

52. **Wartenburg, H.** 634.1 /2-1.4-1.8
 Obstbauliche Ernährungsfragen unter Berücksichtigung der Bodensäure.
 (Nutrition of fruit trees with reference to soil acidity.)
Obst u. Gemüsebau, 1930, 76 : 192-4.
 The problem is very different from that facing the ordinary agriculturist. It seems that fruit trees can often withstand considerable acidity. Cases are cited of the disastrous effect of the addition of lime to a soil having a strongly acid reaction. The principles governing the nutrition of fruit trees in general must first be determined, and then those governing that of particular kinds and varieties.

PHYSIOLOGY, CHEMISTRY, ETC.

53. **Gibbs, Margaret A., and Swarbrick, T.** 634.11: 581.145

The time of differentiation of the flower bud of the apple.

J. Pom. Hort. Sci., 1930, **8** : 61-6, bibl. 11.

The time of differentiation of the flower bud varying with the locality, it was required to find the time for the Long Ashton district. The examination was made in 1928 on Lane's Prince Albert, 10 years old, on Malling Type II. rootstock, buds being taken from three similar trees bearing a light crop following a heavy one of the previous year. The technique is described. In buds of spurs on one or two year old wood, differentiation of flower parts begins during the last fortnight in June. Sepal primordia were distinguishable on July 2nd. In axillary buds on current year's wood, differentiation took place a month later.

54. **Rasmussen, E. J.** 634.11: 581.145

The period of blossom bud differentiation in the Baldwin and McIntosh apples.

Proc. Amer. Soc. Hort. Sci., 1929, **26** : 255-60, bibl. 10.

Different localities vary in time and period of fruit bud differentiation. In the Baldwin no difference was found in these experiments in the different types of spurs or on trees grown under different cultural methods. In the McIntosh in 1928 the buds on spurs which originated on 1927 wood showed the first appearance of blossom buds ten days later than those of older spurs. In 1929 no such difference was seen. This was probably due to the delayed differentiation in buds collected from the previous year's wood.

55. **Magness, J. R.** 634.11/13: 581.144.4: 581.145

Relation of leaf area to size and quality of apples and pears.

Proc. Amer. Soc. Hort. Sci., 1929, **26**, pp. 160-2.

The development of fruit buds results from the accumulation of synthesized materials after the needs of the fruit have been supplied. Hence thinning is an essential to their production at least in Western United States. Thickening of buds, spurs, twigs and trunk depend also on the same excess of synthesized material after satisfying the demands of the fruit.

56. **Poliakoff, N. K.** 634.1/2: 581.45: 519

Methodics for determining the leaf surface of fruit trees. [Russian-English summary.]

Mleev Hort. Exp. Sta. Pom. Sect. Bull. **40**, 1930, pp. 28.

He uses the method of maximum width of leaf x maximum length in mm. =surface of leaf in cm^2
varietal coefficient

for determining leaf area, having got the varietal coefficient empirically by measurement of forty leaves. He considers it possible to get area of leaves with great precision, whether spur leaves or others, irrespective of locality where tree is grown. For given varietal constants a table of leaf areas may be constructed, corresponding to each product of length and breadth, which facilitates determination of leaf area.

An example of such a table is given.

57. **Heinicke, A. J.** 634.11: 581.11

A method of studying the relative rates of transpiration of apple leaves and fruits.

Proc. Amer. Soc. Hort. Sci., 1929, **26** : 312-4, bibl. 3.

An account of a simple absorption method of measuring transpiration for obtaining data in studies involving comparisons in the rates of water loss, whenever the entire plant cannot be used.

Apparatus needed : glass weighing bottle about 25 by 40 mm., ground glass stopper and rubber gasket consisting of a band 5 to 7 mm. wide, 1 mm. thick, with inside diameter of 25 mm., a supply of dry calcium chloride.

58. **Knight, R. C.** **634.1 /2-1.542:581.144**
Some effects of pruning leaders and of the absence of laterals on the rate of growth of stems of apple and plum.
J. Pom. Hort. Sci., 1930, **8** : 93-105, bibl. 4.
The absence of lateral shoots on older stems had practically no influence on the rates of extension growth on diameter increase of newly developing shoots.
Stems carrying no laterals show lower rates of diameter increase throughout the season than normally furnished stems. The lower region of the former grows more slowly than the upper region in the early part of the season, but later the position is reversed. In the "feathered" stems the lower region grows as rapidly as the upper at first and much faster thereafter. The results help to show how the differences in the progress of the downward wave of cambial activity from newly developing shoots are reflected in the girth of older stems.

59. **MacDaniels, L. H., and Curtis, O. F.** **634.11-1.542.24:581.175**
The effect of spiral ringing on solute translocation and the structure of the regenerated tissues of the apple.
Univ. Cornell Agr. Exp. Sta. Mem. **133**, 1930, pp. 31, bibl. 18.
Conclusions reached include the following : Lateral transfer of solutes and food substances is relatively slow. On spiral ringing, nitrate being added to soil, N movement to branches immediately above the end of the spiral is greatly reduced. The phloem is the more important tissue involved in translocation. Correlation between high N content and high catalase activity of the leaf tissues was found to be close. The conducting tissues formed by the cambium subsequent to ringing changed their orientation so that the long axes of the elements were parallel to the spiral. Structural changes in vascular tissues providing for more rapid lateral conduction began soon after ringing.
Cambial growth is made in response to the coming together of the food from the leaves and nutrients from the roots.

60. **Pearl, R. T.** **634.11-1.521.3-1.547**
The winter shoots of apple trees. Their use in the identification of varieties.
J. South-Eastern Agr. Coll., Wye, Kent, 1930, **27** : 74-86, bibl. 5.
Characters of the wood and fruiting shoots of eight varieties are described, the descriptions being reinforced by a series of admirably clear drawings.
The apples dealt with are Allington Pippin, Beauty of Bath, Bramley's Seedling, Early Victoria, Gladstone, Grenadier, Lane's Prince Albert, Newton Wonder, Worcester Pearmain.

61. **Swarbrick, T.** **634.11-1.541.11 /12**
Rootstock and scion relationship. Some effects of scion variety upon the rootstock.
J. Pom. Hort. Sci., 1930, **8** : 210-28, bibl. 31.
A stem piece between the scion and an absorbing root system may exert an influence which outweighs that of the root system, so that it is now possible to obtain very uniform material from a miscellaneous seedling basis. Owing to physiological differences as yet little understood between seedling and vegetatively raised rootstock it is possible that this scion effect is not so easily observed in the case of the latter.

62. **Amos, J., Hatton, R. G., Hoblyn, T. N., Knight, R. C.** **634.11-1.541.11 /12**
The effect of scion on root. II. Stem worked apples.
J. Pom. Hort. Sci., 1930, **8** : 248-58, bibl. 3.
An extension of previous experiments (East Malling Res. Sta. Ann. Rep., 1923, : 110-13) involving the morphological analysis of various combinations (stem-worked) of six commercial scion varieties and four rootstocks. (1) In the maiden year the total weight of roots was characteristic of the stock rather than of the scion, although subsequently the effect of the scion may be more marked, e.g. Grenadier at two years old induces the formation of a larger root

system than other varieties compared with it, and shows a relatively high ratio of root to shoot. (2) Other factors being equal, a large root system has a lower percentage of fibrous roots than a small one. (3) Consequently the use of different scions may indirectly affect the percentage of fibre on the root by altering the size of the whole system. (4) The differences thus produced are small in comparison with the differences between the root systems when unworked, and therefore the latter still unmistakably exhibit their distinctive varietal characters irrespective of the influence of the scion variety. (5) Thus the well marked qualitative differences between the rootstocks are still present in stem-worked trees, and are not obscured by scion influence.

63. **Vyvyan, M. C.** **634.11-1.541.11 /12**

The effect of scion on root. III. Comparison of stem and root worked trees.

J. Pom. Hort. Sci., 1930, 8 : 259-82, bibl. 5.

(1) The distinctive characters of the root systems of two-year-old No. II. and No. VI. East Malling stocks remained approximately constant whether unworked, or worked with scions of their own variety, and whether the two latter were root-grafted on to piece roots or stem-grafted. (2) No. VIII. worked with Beauty of Bath was likewise little affected by the method of working. Root stems of free seedling stocks failed to take on distinctive characters when worked with Beauty of Bath and Grenadier respectively whether or not a length of stock stem was left below the graft union. (3) Grenadier always gave a relatively larger root system than Beauty of Bath and in consequence a smaller percentage of fibre.

64. **Harris, G. H.** **634.1 2-1.541.11 /12:581.144.2: 581.12**

The influence of top on root as determined by root respiration of young fruit trees.

Proc. Amer. Soc. Hort. Sci., 1929, 26 : 329-34, bibl. 4.

Any activity of the top markedly influences the activity of the root as measured by root respiration.

Respiratory activity is dependent on leaf surface and photosynthesis. Although at times there may not be enough respiratory material in the roots for diameter increase, there may yet be enough for length growth. The rapid winter primary root growth would not appear to be very exhausting, and the new unsharpened roots form a ready passage for water or mineral nutrients into the tree, if any such deficit should occur.

65. **Kolesnikov, V. A.** **634.1 /2-1.523:581.144.2**

The root system of fruit tree seedlings.

J. Pom. Hort. Sci., 1930, 8 : 197-209.

The problem was the elucidation of the quantitative relationships of root growth. (1) A definite order prevails in the development of roots in a season. (2) Small rootlets less than 10 mm. long comprise more than 80 per cent. of the total number present. (3) The average root length decreases progressively from the primary to the secondary and lesser roots, but less markedly in a surface than in a deep rooting system. (4) The average length is practically constant in systems of the same variety, and is often constant throughout the season. (5) The average root length of a system can be determined by examination of a small sample.

66. **Sledge, W. A.** **581.165.72:581.144.2**

The rooting of woody cuttings considered from the standpoint of anatomy.

J. Pom. Hort. Sci., 1930, 8 : 1-22, bibl. 16.

Two separate and opposed gradients of cambial activity have been detected in the cuttings, the one associated with swelling buds and the other with the severed end of the shoot. Observations on the presence or absence of air across the cambial layer in stems of dormant and growing shoots support the suggested importance in relation to meristematic activity of the distribution of air in the intercellular spaces of the shoot. Therefore a wound stimulus functioning through the injection of the intercellular spaces of the region around the cambium has an important part in the initiation of basifugal cambial activity. The failure of cambial activity at the distal end of cuttings cannot be accounted for by the basipetal transport of food which takes place, and points to the existence of another unknown factor also involved.

67. **Kvarazkhelia, T. K.** **634.1 /2: 581.144.2**
 On the question of the biology of the root system of fruit trees. [Russian-English summary.]
Abkhazian Agr. Exp. Sta. Sukhumi Pub., 1927, pp. 113.
 Gives soil analyses in various districts, and tables showing the root systems of fruit trees in these soils, the reasons for the particular formation taken by the roots being discussed.

68. **Brunstetter, B. C., and Magoon, C. A.** **581.192: 545.371: 541.13**
 A micro-electrode for the rapid determination of hydron concentration of expressed juices from small amounts of plant tissue.
Plant Physiology, 1930, 5 : 249-56, bibl. 11.
 The micro-electrode of Bodine and Fink is modified to deal with plant juices: (1) By substituting a mercury for a vaseline seal; (2) By the fusion of a side-tube, equipped with stopcock and rubber bulb, opposite the hydrogen inlet to secure filling and washing of the electrode vessel. Data of its use are given.

69. **Tetley, Ursula.** **634.11: 581.145.2: 581.192**
 Studies of the anatomical development of the apple, and some observations on the pectin constituents of the cell walls.
J. Pom. Hort. Sci., 1930, 8 : 153-72, bibl. 12.
 (1) An account is given of the developmental stages in the formation of the mature apple.
 (2) The structural peculiarities found in the epidermal layers of a range of varieties is given together with an account of the variation found in cork formation. (3) An alternative interpretation is suggested as to the meaning of the discs, crescents and bands of Carré and Horne. The conclusion is reached that they are accumulations of "pectic" material round pits in the wall, looked at from different points of view.

70. **Lange, K. P.** **634.1 /2-1.537-2.111**
 Investigations of frost injuries on nursery trees. [Russian-English summary.]
Mleev Hort. Exp. Sta. Pom. Sect. Bull. 32, 1930, pp. 32, bibl. 14.
 Observations made in 1929 confirm the investigations of Losovsky, Gräbner, Chandler. The degree of injury suffered by the cambial ring determines the fate of the tree. Chief symptom of the degree of injury of this is the colouring in spring of the whole complex of cells of the cambium. Apples in which the external phloem was destroyed, but a second cork was formed, were not checked in growth.

71. **Tufts, W. P.** **634.1 /7-1.547.6: 551.52**
 Seasonal temperatures and fruit ripening. A preliminary report.
Proc. Amer. Soc. Hort. Sci., 1930, 26 : 163-6.
 Local environment is of the utmost importance in California, often determining the suitability or the reverse for fruit growing. Additional temperature stations are being established in sections of comparable altitude, soil moisture and latitude.

72. **Nuccorini, R., and Zaccagnini, A.** **634.1 /8-1.556.1: 581.192: 547.476 /7**
 Ricerche chimiche sulle frutta. Intorno ai metodi per la separazione ed il dosaggio degli acidi organici non volatili delle frutta. (Methods for separation and estimation of the non-volatile organic acids of fruits.)
Annali della sperimentazione agraria, 1930, 4 : 281-99, bibl. 29.

73. **Nuccorini, R., and Zaccagnini, A.** **634.1 /8-1.556.1: 581.192: 547.476 /7**
 Ricerche chimiche sulle frutta. La determinazione degli acidi tartarico, citrico, malico, e succinico nella frutta. (Determination of tartaric, citric, malic and succinic acids in fruit.)
Annali della sperimentazione agraria, 1930, 4 : 301-6, bibl. 3.
 An account of the methods found most satisfactory by the authors. These differ somewhat from those described by them in the article immediately previous.

74. **Nuccorini, R., and Zaccagnini, A.** 634.1/8 1.547.6:581.192:547.476/7
Ricerche chimiche sulle frutta. Sulla maturazione precoce e tardiva in rapporto agli acidi delle frutta. (Fruit acids and their relation to time of ripening.)
Annali della sperimentazione agraria, 1930, 4 : 307-22, bibl. 2.
A list is given of seventy-three different kinds of fruit, mainly tropical or sub-tropical, whose acid content has been found. The predominating acids and the names of the workers concerned are noted. Data from the authors' own experiments on deciduous tree fruits show that with the early summer fruits examined—with the exception of one lot of peaches—the early varieties possess a greater content of total acids than do late varieties and that this greater content is related to a superabundance of malic acid.
In apples tartaric, citric and malic acids are formed in early varieties, but in late varieties only malic acid. Only malic acid was formed in the pears examined.

CITRUS.

75. **Toxopeus, H. J.** 634.3:581.141
De polyembryonie van Citrus en haar beteekenis voor de cultuur. (Polyembryony of citrus and its significance in citrus culture.) [English summary.]
Korte Med. Alg. Proefsta. Landb. Poenten, Malang, 8, 1930, pp. 15, bibl. 10.
An examination of 200 to 300 specimens each of different Javanese forms of citrus showed the vegetative seedlings produced from the mother plants as follows: *C. med* 40-50 per cent., *C. hybr.* 54-96 per cent., *C. mitis* 98.6-100 per cent., *C. nob.* 92-100 per cent.
Methods for eliminating seedlings of generative origin are given. In the seed of a complicated hybrid nearly all the generative seedlings differ from the vegetative type. When the mother plant is not a hybrid and the percentage of vegetative seedlings is less than 90, the generative seedlings may be made to differ from the vegetative type by crossing with a very different male plant.
New varieties of polyembryonic citrus can be imported as seed. The large percentage of vegetative offspring is a serious obstacle to the artificial production of hybrids.
Polyembryony is very favourable to the vegetative propagation of somatic variations, which are very numerous in citrus.

76. **Haas, A. R. C.** 634.3:546.27
Boron as an essential element for healthy growth of citrus.
Bot. Gaz., 1930, 89 : 410-3.
The absence of boron in water and sand cultures has a bad effect. In water cultures root decline generally precedes foliage decline. In sand cultures foliage symptoms are obvious early enough to save the plants if required. Similar foliage symptoms having been observed in the field, the possibility of boron deficiency there is under investigation.

77. **Chace, E. M., and Church, C. G.** 634.31:575.24:581.192
Inheritance of composition of Washington navel oranges of various strains propagated as bud variants.
United States Dept. Agr. Tech. Bull. 163, 1930, pp. 22, bibl. 11.
The study here reported revealed that differences in the chemical compositions of strains exist and that these are inheritable. The differences generally found were in the quantities of peel, oil, insoluble solids and acid.

78. **Waynick, D. D., and Walker, S. J.** **634.31: 581.144.2**
 Rooting habits of citrus trees.
Californian Citrograph, 1930, 15 : 201, 238-9.
 The growth of roots and tops of citrus is cyclic, with the growth of the roots preceding that of the tops, and not overlapping till the autumn, when the two may coincide if the growth cycle is the fourth of the season. There may be a decided rest period between the time when the roots cease to elongate and the growth of the tops begins.
 Periods of active root growth may be followed by periods of two or even three months during which there is no elongation. 90 per cent. of the actual active rooting area is in the upper 22 inches of soil. Early spring growth first starts below the 14 inch depth line.
 The application of the knowledge so far gained to present cultural practice is discussed.
 The studies are continuing.

79. **Copeman, P. R. v. d. R.** **634.31: 581.192**
 A note on the abnormalities in the composition of oranges.
South African J. Sci., 1930, 27 : 310-6, bibl. 4.
 Analyses were made for the determination of soluble solids, sugar, and acid of the fruit of six unsprayed trees.
 Application of statistical methods (described) indicated that two of the trees were abnormal and could be discarded for the purpose of taking normal samples. Applied practically this shows that fruits from individual trees may possess a composition almost entirely unrelated to that of other trees in the same orchard. It being important to produce a uniform crop, the abnormal trees should be eliminated, unless cultural treatment brings amelioration.

80. **Lord, E. L.** **634.3-1.415-1.8**
 Soil acidity and citrus grove fertilization.
Citrus Industry, 1930, 11 : 2 : 4-5.
 Citrus trees cannot be adequately manured unless the soil reaction of the soil in which they are growing is first ascertained. The article explains why.

81. **Benton, R. J.** **634.31-1.541.1**
 Citrus growing problems. The influence of bud selection.
Agr. Gaz. New South Wales, 1930, 41 : 853-7.
 Urges the use of trees worked only with buds from trees producing superior fruit. Deprecates the tendency to plant unguaranteed trees because of their slightly lower price.

82. **Brown, D. D.** **634.3-1.542.24**
 Cincturing citrus trees. 1929-30 Experiments.
J. Dept. Agr. Victoria (Aust.), 1930, 28 : 729-32.
 In one orchard cinctured trees (selected for their poor bearing) bore double the crop of the controls.

83. **Robinson, H. E.** **634.3-1.547.5**
 Controlling the fruiting tendency of citrus.
Citrus Industry, 1930, 11 : 1 : 10, 22. (Repr. from *Texas Citriculture*.)
 After an explanation of the physiology of fruit formation states that fruitfulness is controlled through the adjustment of the nitrogen carbo-hydrate ratio, the ratio being more important than the total amount of each. The carbo-hydrate supply will be increased by proper pruning, and disease and insect control, together with efficient soil management, while the nitrogen supply will be maintained by manuring, cultivation, irrigation and cover crops.

84. **West, E. S.** 634.3-2.111
 Protection of young citrus trees from frost.
Agri. Gaz. New South Wales, 1930, 41 : 329-33.
 Various expedients were tried on 117 young trees divided into groups for the various experiments. Three severe frosts were experienced from June 12th to 14th, the mean lowest temperature for the three mornings 2 cm. above ground being 21.6° Fahr. From the trial it appeared that (1) Wrapping a few thicknesses of paper round the stem of the trees gave very effective protection. (2) Mounding soil up round the stem was effective protection to the stem but increased injury to the branches. (3) Protecting the stem with a cylindrical wire netting frame 3 inches in diameter covered with hessian was less effective. (4) Placing a hessian bag either tarred or not tarred over the tree was distinctly detrimental.

85. **de Villiers, F. J.** 634.31:668.526.4
 Essential oils from South African oranges.
Farming in South Africa, 1930, 5 : 153-4.
 A discussion of the écuelle process and reports from importers and two firms of manufacturing chemists in London on quality of oil produced.
 The écuelle method appears suitable for small scale production in presence of cheap labour. 1 ton of fruit produces 3 to 5 lbs. of oil and it was found that each orange took two minutes to do. A sharper and more penetrative aroma might be got by extracting at low temperatures.

86. **de Villiers, F. J.** 634.31:668.526.4
 Citrus by-products research. Orange oil.
Farming in South Africa, 1930, 4 : 515-6, 529.
 Notes on research by the Department of Agriculture. South African oranges per given weight yield as much or more than customary foreign quotations. This is especially the case with Valencias. Valencias yielded appreciably more than Nnavels, the quality of oil being the same. Locality of growing produced no effect on oil. Oranges for oil extraction should not be stored more than two months. Culls yielded practically as good oil as fruit for export. A ton of small fruit yields more than a ton of large.
 Investigations continue on methods of commercial extraction.

87. **Shill, A. C.** 634.31-1.57
 Orange by-products.
Empire Marketing Board Memorandum (Stencil), 1930, pp. 24, bibl. 11.
 Owing to increased production leading to increased competition and consequently a higher standard of marketable fruit, resulting in more rigorous grading, the number of unsaleable oranges is very greatly increased and their utilization has become a major problem of the industry. This memorandum surveys the position and discusses various by-products which can be manufactured from under-grade oranges. Attention should chiefly be turned to such products as juice preparations, orange oil, pectin and possibly vinegar and wine. It is pointed out that no simple effective method of preserving orange juice without impairing its quality and vitamin content has yet been devised.

TROPICAL CROPS.

88. **Tunstall, A. C.** 633.72:581.144.2
 Some observations on tea roots.
Indian Tea Assocn. Sci. Dept. Q. J., 1930, pp. 75-8.
 Describes a fungal infection of the roots of tea.
 This fungus is always present in the form of external and internal mycelium on the young roots which absorb nutriment. On the older roots which have other functions it is absent. The roots of infected tea plants have very short hairs, whereas uninfected tea seedlings have root hairs in large numbers. It is tentatively suggested that the mycelium may supplement the work of the missing root hairs.

88. **Tunstall, A. C.** 633.72-1.521
 Some observations on tea leaves.
Indian Tea Assocn. Sci. Dept. Q. J., 1930, pp. 113-9.
 Preliminary observations made with a view to selecting high yielding strains.

90. **Prillwitz, P. W. H. H.** 633.72: 631.811.7
 De invloed van zwavelbemesting op de bodemreactie en den groei van thee.
 (The influence of sulphur on soil acidity and on the growth of tea.) [English summary.]
Archief voor de Theecultuur in Nederlandsch-Indië, 1930, pp. 69-87.
 Experiments at Buitenzorg show that sulphur manuring is the best means of increasing soil acidity. Two years after treatment (1,000 g. sulphur per sq. metre mixed with soil to depth of 6-8 inches) soil acidity was increased to a depth of 16-18 inches. The stimulating effect on the growth of young tea plants is contrasted with the stunting effect of liming.

91. **Chevalier, A.** 633.73
Les cafésiers du globe. Fasc. I. Généralités sur les cafésiers. (Coffee trees of the world—generalities.)
 8vo. Lechevalier, 12 Rue de Tournon, Paris VI^e, 1929, pp. 196, figs. 32, bibl. 106.
 This volume, which will be followed by part II., Méthodes de culture et production dans les différent pays—and part III., Composition, préparation, utilisation et commerce du café, contains chapters on the origin of coffee; coffee growing in the past; coffee from the botanical standpoint; coffee from the biological standpoint; and ordinary cultural practices.

92. **Janssens, P.** 633.73
 Le café robusta dans l'Angola.
Bull. Agr. du Congo Belge, 1930, 21 : 60-79, 172-206, 664-91.
 An illustrated article on coffee growing in Angola with an account of the methods in use. Includes a description of methods of grafting coffee. Claims that scions from high yielders when grafted produce equally high yielding bushes. A description is given of methods and machinery used in preparing coffee for market.

93. **Empire Marketing Board.** 633.74: 658: 338
 Cocoa, world production and trade.
Empire Marketing Board Memorandum 27, 1930, pp. 97.
 A comprehensive review of the present situation.

94. **'Auchinleck, G.** 633.74: 664.8
 Storage of cacao in the tropics. (Extract from a memorandum.)
West India Committee Circ. 45, 1930 : 439-40, 465-6.
 The general opinion of the Department of Agriculture of the Gold Coast is that with sound preparation and with storage accommodation comparable in efficiency to good warehouses in London or Liverpool it should be possible to keep cacao for long periods in the Gold Coast without deterioration.

95. **The Imperial Institute.** 633.85: 338
 The production of Tung Oil in the Empire.
Empire Marketing Board Memorandum 31, 1930, pp. 20, bibl. 4.
 Deals with sources and production, possibility of further development, methods of cultivation, growth of trees and yield, plantation costs, utilization of nuts, future outlook.

96. **Tengwall, T. A.** **633.912: 581.084.2**
 Over de correlatie tusschen de opbrengsten van de in een vakkenproef onderzochte objecten. (The correlation between the yields of the objects of an experimental field.) [English summary.]
Archief voor de Rubberveldkunst in Nederlandsch-Indië, 1930, 14 : 361-9.
 In an investigation on the correlation between the yields of the objects in forty-two rubber experimental fields, together representing 116 pairs of objects, the correlation coefficients were generally very high. There is no reason to believe that these correlations were other than linear.

97. **Geraldes, C. de M.** **634.6: 665.3**
 Contribution a l'étude des fruits des variétés de palmiers à huile et de leurs huiles. (Study of the fruits of oil palm varieties and of their oils.)
Bull. Mat. Grass., 1930, 4 : 97-104.
 Deals with the varying composition of different varieties.

98. **Geraldes, C. de M.** **634.6: 665.3**
 Renseignements sur le palmier à huile en Angola. (Notes on the oil palm in Angola.)
Bull. Mat. Grass., 1930, 4 : 105-12.
 Notes on distribution, varieties, composition of fruit, trade.

99. **Pope, W. T.** **634.651**
 Papaya culture in Hawaii.
Hawaiian Agr. Exp. Sta. Bull. 61, 1930, pp. 40, bibl. 24.
 Deals comprehensively with the whole subject, giving the early history of the fruit, modern methods of cultivating it, and finally a selection of recipes for its cooking.

STORAGE AND TRANSPORT.

100. **Kidd, F., and West, C.** **664.85.035.1**
 The gas storage of fruit. II. Optimum temperatures and atmospheres.
J. Pom. Hort. Sci., 1930, 8, pp. 67-77.
 Report on a series of thirty different storage conditions to ascertain the interaction of the three variables, (1) temperature, (2) concentration of carbon dioxide, (3) concentration of oxygen ; in the storage of Bramley's Seedling Apple.

101. **Plagge, H. H., and Gerhardt, F.** **664.85.11: 581.192**
 Acidity changes associated with the keeping quality of apples under various storage conditions.
Iowa State Coll. Agr. Exp. Sta. Res. Bull. 131, 1930 : 344-58, bibl. 9.
 The following tables are given and discussed :—
 1. Comparative analyses of Grimes apples at beginning and close of commercial storage, 1925-6.
 2. Ditto for Jonathan apples, 1925-6. 3. Acidity changes of Grimes apples at monthly intervals throughout cold storage period, 1925-6. 4. Relation of percentage of total acid loss in Grimes during storage to soggy breakdowns at various storage temperatures, 1926-7. 5. Acidity changes of Jonathan apples at monthly intervals throughout cold storage period, 1925-6.
 6. Relation of total acid loss to Jonathan Spot, 1925-6.

102. **Tiller, L. W.** 664.85.11.037:656.61
 Relation of storage temperature to the overseas carriage of some varieties of New Zealand export apples.
New Zealand Dept. Sci. Indust. Res. Bull. 23, and *Cawthron Inst. Cold Storage Pub.* 6, 1930, pp. 16.
 Report on the special work on cold storage undertaken by the Cawthron Institute, 1929, to determine the optimum temperature and humidity conditions for the storage of the main varieties grown in New Zealand. Conditions of overseas transport were simulated as far as possible and much light has been thrown on the behaviour of six main export varieties:—Cox's Orange Pippin, Dunns Favourite, Jonathan, Delicious, Statesman, Sturmer.

103. **Trout, S. A.** 664.85.13
 Experiments on the storage of pears in artificial atmospheres.
J. Pom. Hort. Sci., 1930, 8 : 78-91, bibl. 3.
 Providing the temperatures are not too high, and that more than 10 per cent. carbon dioxide in the atmosphere is avoided, it is possible by excluding oxygen for a period to extend the storage life of pears to the extent of 50 per cent. of the normal for any given temperature. The above treatment prevents scald in susceptible varieties. Exclusion of O₂ and the consequent cessation of the normal respiratory oxidations set up conditions in which the carbo-hydrate metabolism of the fruit leads to the accumulation of acetaldehyde in the tissue. This is associated with scald and core breakdown. The present experiments indicate that the chain of causation is more likely to be, breakdown—waterlogging of tissue—anærobic conditions with CO₂ accumulation—aldehyde formation, rather than aldehyde formation—toxic action—breakdown and waterlogging.

104. **Leonecini, G.** 664.85.13 + 22.037:581.192
 Studi sulle frutta. Se esista un rapporto fra le quantità di alcuni costituenti del succo di varietà diverse di susine e di pere e la durata della loro conservabilità in frigorifero. (The relation of keeping qualities of different varieties of plums and pears to the amounts of certain constituents in their juices, Progress of certain biochemical phenomena during their storage.)
Annali della sperimentazione agraria, 1930, 4 : 249-62.
 During cold storage saccharose increased in amount in one variety and made an appearance in others. The data support the view that a correlation exists between the cold storage life and the amounts of certain chemicals present in the juice at the time of picking of certain plums and pears, and in some cases between the length of storage life and the progress during storage of part of the biochemical phenomena of slow ripening.

105. **Bottini, E.** 664.85.13.037
 Sull'attitudine di alcune varietà di pere alla conservazione in frigorifero. (Reactions of certain pears to cold storage.)
Annali della sperimentazione agraria, 1930, 4 : 207-39, bibl. 9.
 Great differences are shown as between different varieties. Preservation at 1-2° C. prolonged the lives of most varieties tested but to varying degrees. Success or the reverse was found to be due to the storage temperature, the humidity of the store, ventilation of the store and the variety.

106. **Leonecini, G., and Zweifel, G.** 664.85.22.037:581.192
 Studi sulle frutta. La pectina e il ritardo nella seneszenza di alcune varietà di susine. (Pectin and delay in deterioration of certain varieties of plum.)
Annali della sperimentazione agraria, 1930, 4 : 271-9, bibl. 7.
 Seven varieties were tested. The varieties which stored best were those which at picking contained a low pectin percentage. With one exception, that of a small wild plum, deterioration set in most slowly in those varieties, where biochemical phenomena were conducive to the following condition, namely:—at the time when deterioration symptoms appeared the pectin percentages were less than those existing at the time of picking.

107.

Leoncini, G., and Levi, G.**664.85.25.037:581.192**

Studi sulle frutta. Se esista un rapporto fra le quantità di alcuni costituenti del succo di varietà diverse di pesche e la durata della loro conservabilità in frigorifero. (A correlation of the amounts of certain juice constituents present in different peach varieties with their cold storage life.)

Annali della sperimentazione agraria, 1930, 4 : 263-70.

The varieties were H. Beauty, Elberta, Victor and Mayflower. In these varieties the greater the amounts of free organic acids present at the start, i.e. malic acid, the longer was the storage life.

108.

Bottini, E.**664.85.31**

Sulla conservazione delle frutta. Ricerche sperimentali esequite sulle arancie. (Food preservation, experiments on oranges.)

Annali della sperimentazione agraria, 1930, 4 : 165-99, bibl. 15.

Notes on orange growing in and exports of oranges from Italy are followed by a discussion of chemical composition and actual tests made in 1925-6. 90 per cent. of the loss from wastage and mould can be eliminated by :—(1) The use of chemicals to ensure proper atmospheric conditions without transmission of flavour. (2) The use of a packing system allowing for elimination of humidity and conservation of proper atmosphere. The best substances were found to be ammonium carbonate and trioxymethylene used simultaneously. The best containers are crates or small barrels.

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109.

Imperial Bureau of Fruit Production**634.1 /8 + 664.85(063)**

**Proceedings of the first Imperial Horticultural Conference*, London, August, 1930.

Part I. Economic and administrative. pp. 36.

Part II. Application of science to horticulture. pp. 58.

Part III. Progress in fruit storage methods. pp. 101, illust.

Part I.

BROWN, J. L.

The evolution of the New Zealand Fruit Control Board.

BURNS, W.

Horticultural research in an Indian Province.

HAHNE, B.

Horticultural research in the Union of South Africa.

KEEBLE, F.

An industrial research station.

MACOUN, W. T.

Experiences of centralized horticultural research in Canada.

McDOUGALL, F. L.

Fruit growing in the British Empire.

PALMER, E. F.

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STOCKDALE, F. A.

Sources and training of future horticultural research workers.

Part. II.

BARKER, B. T. P.

Fruit products and associated problems.

BLACKMAN, V. H.

Some physiological considerations in horticulture.

CHEESMAN, E. E.

Practicability of the application of statistical method in the case of tropical and sub-tropical crops.

FREEMAN, W. G.

Tropical and sub-tropical fruit industry. Difficulties encountered and lines of attack.

* Parts II and III, price 2/- and 2/6 respectively, are obtainable from the Imperial Bureau of Fruit Production, East Malling, Kent. Part I is out of print.

HOBLYN, T. N. The adaptation of modern statistical methods to horticultural conditions.

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MASON, T. G., and MASKELL, E. J. Plant physiological work in the tropics. Some of the problems, with special reference to cocoa and some possible lines of attack.

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TAYLOR, H. V. Meteorology and fruit growing. A British scheme of research.

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ARCHBOLD, H. K. Chemical change in stored apples. The relation of the time of picking to the chemical composition and storage life of the apple.

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GRIFFITHS, E. A. Problems of storage and transport.

HORNE, A. S. The infection and invasion of the apple fruit by fungi in relation to the problem of storage.

KIDD, F. A survey of some of the principal fruit storage and transport problems of the Empire today.

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WHEELER, R. L. Fruit transport problems in Canada.

YOUNG, W. J., and READ, F. M. Experiments on the preservation of citrus fruits.

110. **Royal Horticultural Society.** 634/5.(063)
 1930: *Ninth International Horticultural Congress Report and Proceedings.*
 8vo. R.H.S., Vincent Square, London, S.W.1, pp. 450, illus.

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In Group A.

CALVINO, E. M. Seed germination in roses. (Italian-English summary.)

CALVINO, M. A stock for dwarfing the olive tree. (Italian-English summary.)

CRANE, M. B., and LAURENCE, W. J. C. Studies in sterility.

DAHL, C. J. Rootstocks from seeds of known parents.

DARNELL-SMITH, G. P. Points in germinating some Australian seeds.

DENNY, F. E. The excitation of buds under external stimulus.

ESBJERG, N. Varieties grown on own roots.

GRAHAM, R. J. D., and STEWART, L. B. Special methods of practical utility in vegetative propagation of plants.

LEK, H. A. A. v.d. Anatomical structure of woody plants in relation to vegetative propagation.

PRIESTLEY, J. H. Vegetative propagation from the standpoint of plant anatomy.

REID, M. E. The influence of nutritive conditions of seeds and cuttings upon the development of roots.

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YERKES, J. E. Raising rootstocks from seed in the United States.
 ZIMMERMANN, P. W. Oxygen requirements for rootgrowth of cuttings in water.

In Group B.

AUCHTER, E. C. American experiments in propagating deciduous fruit trees by stem and root cuttings.
 BARKER, B. T. P. The fruit tree complex in relation to environment.
 FAES, H. Vine propagation. (French-English summary.)
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 CRAMER, P. J. S. The bud grafting of rubber.
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